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TITLE: War Syndromes from 1900 to the Present: Symptom Patterns
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13. ABSTRACT (Maximum 200 Words) This historical study of the nature of war syndromes investigates their essential characteristics by use of war pension files. It looks at randomly-selected populations of UK servicemen and women drawn from the Boer War, World War One, World War Two, Korea, Malaya and the Persian Gulf War. The diagnoses studied include: DAH, effort syndrome, rheumatism, neurasthenia, shell shock, gassed, dyspepsia, psychoneurosis and Gulf-related illness. These war syndromes are related to nature of recruit, rank, type of unit, exposure to combat and other traumatic experiences and to military conduct. Veterans' health records were examined to discover whether war syndromes were related to wounds or other forms of illness acquired during service. In addition, servicemen's attributions are also explored in relation to prevailing health beliefs and advances in medical science. A mortality and morbidity study of randomly-selected veterans from the Boer War and World War One compared samples suffering from DAH and neurasthenia/shell shock with ex-servicemen awarded a pension for minor gunshot wounds. The controls were matched by rank and level of disability.				
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Abbreviations used in text

BEF	British Expeditionary Force
DAH	Disordered Action of the Heart
DSS	Department of Social Security
GSW	Gunshot wound
GVMAP	Gulf Veterans Medical Assessment Programme
NCO	Non Commissioned Officer
PRO	Public Record Office, Kew, London
RAF	Royal Air Force
VDH	Valvular Disease of the Heart

Introduction

This supplementary report summarises the research project into war syndromes from 1900 undertaken from 9 February 2001 to 30 July 2001. It was designed to answer two questions:

1. Whether medically unexplained symptoms experienced by soldiers after combat (war syndromes) are similar across the century.
2. Whether the morbidity and mortality rates of servicemen with war syndromes are greater than a control population of veterans with equivalent levels of physical disability.

To answer the first question, it was proposed to compare the symptom patterns of a random sample of 200 servicemen who had served in the Boer War and had been diagnosed as suffering from Disordered Action of the Heart (DAH) with a group of 200 DAH patients from the First World War, 200 Effort Syndrome patients from the Second World War and 200 veterans with functional disorders from the Korean War. These would then be contrasted with a random sample of 400 veterans who had served in the Gulf War and suffered from Gulf-related illnesses.

To answer the second question, it was proposed to compare 700 servicemen with DAH from the First World War with 700 single-limb amputees matched to a similar level of disability. The death certificates of all 1,400 veterans would allow a comparison of their morbidity and mortality rates.

The first two years of the project were allocated for the identification of records, negotiations to obtain access and the extraction of data. The third year was for the analysis of the database and interpretation of results.

BODY

Contributors

The initial study was designed by Ian Palmer and Simon Wessely. Further archival research led to modifications by Edgar Jones, who undertook a pilot study, together with other changes by Simon Wessely and Kenneth C. Hyams. Edgar Jones has been the project manager from the outset and drafted this report. Primary research and analysis of database were undertaken by Charlotte Beech, Robert Hodgins-Vermaas, Helen McCartney and Denise Poynter. Brian Everitt, Professor of Biostatistics at the Institute of Psychiatry, was responsible for the factor and cluster analysis. Colin Chalmers, senior lecturer in statistics at the London School of Economics, and Paul Seed, lecturer in statistics at GKT School of Medicine, were responsible for analysis of the mortality and morbidity study.

Specialist advice was sought in cardiology from Dr Stephen Holmberg and Dr Iqbal Malik, in gastroenterology from Dr Ian Forgacs and Sir Christopher Booth, in radiology from Dr Michele Marshall, Dr Erica Denton and Dr C.N.O'N. Digges, and in medicine from Professor Harry Lee and Dr Roger Gabriel. The help of the Army Historical Branch of the Ministry of Defence is also gratefully acknowledged. The Department of Social Security provided access to, and help with, the war pensions archive. Our thanks are due to Mrs Jenny Robb and to Mr Paul Griffiths for their support and assistance.

The salaried staff were as follows:

Dr Edgar Jones (9 February 1998 to present)

Dr Helen McCartney (9 February 1998 to 31 March 2000)

Denise Poynter (9 February 1998 to 31 December 1999)

Charlotte Beech (1 April 2000 to 31 July 2001)

Robert Hodgins-Vermaas (1 April 2000 to present)

Diane Bunting, part-time secretary and administrator (1 August 1998 to 31 October 2000).

QUESTION ONE: SYMPTOM STUDY

The Identification and Selection of Data

For a full description of the data identification and selection criteria see the Final Report (March 2001).

In 1999, an additional five-months funding was granted to research servicemen from World War One who had been subjected to gas attack and nurses who served in France. To ensure consistency with other subjects in the study, it was proposed to use the war pensions files held at the Public Record Office.

(i) Gassed servicemen

The task of extracting these records proved more complex than envisaged. Individual pension files are listed in the PRO catalogue alphabetically by name of recipient with a note of the principal diagnosis for which the award was granted. A survey revealed that 279 veterans awarded a war pension for the effects of gas or gas poisoning (Table 1). A systematic examination of these cases showed that many showed the symptoms of serious exposure to toxic gases with identifiable damage to lungs, skin and eyes.

Soldiers who had lesser exposures and no lasting objective signs and yet suffered from unexplained symptoms were often re-categorised by doctors as cases of Disordered Action of the Heart (DAH) (WIHM, RAMC/2045 Meakins and Walker, 1918, 19-26). It was necessary, therefore, to examine all 279 veterans with a pension for gassing to distinguish the organic cases from the functional ones. Approximately 30% proved to have objective signs of toxic exposure and were excluded from the investigation. A further 20% had incomplete or limited medical files and were also excluded. This gave a total of 143 cases. To obtain a significant sample, it was necessary to select randomly large numbers of DAH files. These were then read to identify those veterans who had been gassed rather than functional cardiac admissions. Approximately, 12% of DAH cases had been gassed. Twenty-four such servicemen were added to the sample in this fashion, bringing the total to 167.

Table 1 Analysis of World War One Pensions

Disorder	As a single diagnosis	Multiple diagnosis
Gunshot wounds	3644 (16)	4510
DAH	1149 (5)	1561
VDH	299 (1.3)	369
Rheumatism	583 (2.6)	798
Gassed	202 (0.9)	279
Debility	568 (2.5)	992
Neurasthenia	817 (3.6)	1135
Shell Shock	73 (0.3)	100
Anxiety neurosis	38 (0.2)	23
Nervous debility	24 (0.1)	18
Depression	25 (0.1)	21
Manic depressive psychosis	17 (0.07)	16
Schizophrenia	11 (0.05)	10
Psychosis	18 (0.08)	16
Other	15,288 (67.2)	15,288
Total	22,756 (100)	25,136

Figures in parentheses indicate percentages.
Source: Public Record Office, PIN26/1-22,756.

(ii) Nurses

It was also proposed to look at nurses who served with the BEF and who were subsequently diagnosed as suffering from unexplained symptoms. The PIN26 war pension archive at the PRO includes 301 nurses, of whom about 100 had functional disorders. They fall into two diagnostic groups (cardiac and neurasthenia) and will therefore provide a natural comparison with the male DAH and shell shock samples for World War One. Missing or limited data, together with signs of a possible organic disorder, reduced the total number for inclusion in the study to 73; these were divided into two groups: functional cardiac disorders (24) and neurasthenia (49).

As a result, a total of 240 cases were added to the database, which now comprises 1,856 cases (Table 2).

Table 2 The database: total number of cases by war and diagnosis

War – Disorder	Total	Rejected	Entered
<i>Victorian Campaigns (1854-c.1895)</i>			
1. Palpitation	19	0	19
2. Debility	9	0	9
<i>Boer War (1899-1902)</i>			
1. DAH	228	28	200
2. Rheumatism	219	19	200
<i>First World War (1914-18)</i>			
1. DAH	214	14	200
2. Neurasthenia	221	21	200
3. Gassed	167	0	167
4. Nurses	73	0	73
<i>Second World War (1939-45)</i>			
1. Effort Syndrome	67	0	67
2. Psychoneurosis	218	18	200
3. Dyspepsia	100	0	100
<i>Malaya (1948-60) and Korea (1951-53)</i>			
1. Effort Syndrome	1	0	1
2. Psychoneurosis	15	0	15
3. Dyspepsia	5	0	5
<i>Gulf War (1991)</i>			
Gulf-related illness	402	2	400
TOTAL	1,958	102	1,865

Design of the Database

To collect data in a standardised manner across different conflicts and disorders, a questionnaire was designed ('Historical Medical Record') to record the following information:

1. Biographical details of the serviceman: date of birth and death (including cause of death), education, family history, occupation before and after service, medical history, smoking and alcohol consumption.
2. Pension award: date, amount, diagnosis with changes, increments and reductions, and reason for ending.
3. Military record: nature of service (regular, conscript, volunteer), unit, rank, date of enlistment, date of discharge, dates of service abroad, time in combat, wounds suffered and any other traumatic experiences.
4. In total 94 symptoms were identified and arranged in the following sub-groups: fatigue, cognition, cardiovascular and respiratory, gastro-intestinal, genito-urinary, central nervous system, locomotor system, eye, ear, nose and throat, skin, psychological state, sleep problems, other features (including temperature, appetite, weight changes and self-inflicted wounds).

5. The results of medical investigations.
6. The explanations of the servicemen themselves are recorded together with the comments of the various physicians who examined them.
7. The soldier's military conduct with a summary of any offences committed.

A database was created in Microsoft Access.

Analysis of the database

The basic statistical analysis was performed using Access and the results are presented in Tables 3 to 16 below. The advanced analysis was undertaken by Brian Everitt, Professor of Biostatistics at the Institute of Psychiatry, London. The findings are discussed below.

FINDINGS

The inclusion of the 167 gassed servicemen and 73 nurses from World War One, has not materially altered the general findings of the study reported in our Final Report (March 2001). However, they have changed the details of our results and the principal statistics have been amended.

1. Nature of Recruit

The type of serviceman included in the various samples (whether regular, conscript, volunteer, reservist or territorial) reflected the different nature of the conflicts (Table 3). For the Boer War, most of the servicemen that took part were regulars supplemented with a small group of militia (part-time rural soldiers often used as a source for the regular army) and volunteers (Bond, 1969). World War One, which required mass mobilisation, witnessed the introduction of conscription from January 1916, by which all single men were deemed to have enlisted and transferred to the reserve whence they could be called up as required (Marwick, 1965). A vast citizen army was recruited. Conscription was introduced at the outset of World War Two, though there had been an earlier phase of compulsory training for those aged 20 to 21 and encouragement civilians to join the Territorial Army and other volunteer, part-time units (Prasad & Smythe, 1968). The Korean War saw the call up of reservists and the extension of National Service to supplement a stretched regular army (Jones & Palmer, 2000). British troops sent to the Gulf War were overwhelmingly drawn from the regular army, though small numbers of territorials and reservists were also deployed.

Table 3 Nature of Recruit

War – Disorder	Nature of Recruit					
	Regular	Militia	Territorial	Volunteer	Conscript	Reserve
<i>Victorian campaign</i>						
1. Cardiac	19 (100)	0	0	0	0	0
2. Debility	9 (100)	0	0	0	0	0
<i>Boer War</i>						
1. DAH	179 (89.5)	11 (5.5)	0	8 (4)	0	2 (1)
2. Rheum.	173 (86.5)	11 (5.5)	0	12 (6)	0	4 (2)
<i>World War One</i>						
1. DAH	8 (4)	1 (0.5)	10 (5)	111 (55.5)	67 (33.5)	3 (1.5)
2. Neur	12 (6)	0	14 (7)	107 (53.5)	54 (27)	13 (6.5)
3. Gassed	7 (4.2)	0	8 (4.8)	79 (47.2)	63 (37.8)	10 (6)
Nurses	-	-	-	-	-	-
4. DAH	3 (6.1)	0	3 (6.1)	42 (85.5)	1 (2)	0
5. Neur	6 (25)	0	1 (4.2)	17 (70.8)	0	0
<i>World War Two</i>						
1. Effort	4 (6)	0	21 (31.3)	5 (7.5)	34 (50.7)	3 (4.5)
2. Psych.	25 (12.5)	0	33 (16.5)	19 (9.5)	111 (55.5)	12 (6)
3. Dysp.	16 (16)	0	35 (35)	3 (3)	33 (33)	13 (13)
<i>Korea/Malaya</i>						
1. Psych	10 (66.7)	0	0	4 (26.7)	1 (6.7)	0
2. Dysp	4 (80)	0	0	1 (20)	0	0
3. Effort	0	0	0	0	1 (100)	0
<i>Gulf War</i>						
Gulf-related illness	368 (92)	0	15 (3.7)	0	0	17 (4.3)
TOTAL	843	23	140	403	367	80

Figures in parentheses indicate percentages.

2. Distribution by Rank

As regards rank, the distribution within samples reflected both the nature of the pension system and the judgements of physicians making the awards (Table 4). Officers were not entitled to war pensions until World War One. Furthermore, a bias favoured officers during and after World War One in terms of entitlement and percentage awarded because contemporaries believed them more sensitive to the stresses of combat and they had carried responsibility for the men in their units (Mott, 1919). As a result, the neurasthenia sample contains a disproportionate number of officers (17%), while the DAH cohort (2%) has slightly fewer than would be found in the total army population. For the purpose of their entitlement to financial compensation, nurses were classified as officers by the Ministry of Pensions during World War One.

The changing relationship between other ranks and NCOs (including acting and non-substantive ranks such as Lance Corporal) is an important feature of the samples. For the two Boer War populations, NCOs represented 20.3% of all other ranks, for the World War One groups they were 29.7% and for the World War Two samples accounted for 41.8%. A study of 627 NCOs admitted to a base psychiatric hospital in the Middle East showed a low incidence of schizophrenia but a high incidence of

depression and anxiety states, suggesting that this selected population had been subjected to particular stressors (Sim, 1945). Anecdotal accounts show that some infantry battalions, notably the Green Jackets, encouraged corporals to take initiatives in action (Bowlby, 1969). The increasing incidence of war syndromes amongst NCOs was particularly apparent for the Gulf War population. Over half (58.5%) were NCOs and therefore experienced, regular soldiers who had been selected for promotion. It may be that over the last century responsibility has been progressively devolved to NCOs, while in recent years traditional peer support has been eroded.

Table 4 Ranks

War – Disorder	Rank		
	Other Ranks	NCOs	Officers
<i>Victorian campaigns</i>			
1. Cardiac	15 (79)	4 (21)	0
2. Debility	5 (55.6)	4 (44.4)	0
<i>Boer War</i>			
1. DAH	169 (84.5)	31 (15.5)	0
2. Rheumatism	152 (76)	48 (24.0)	0
<i>World War One</i>			
1. DAH	151 (75.5)	45 (22.5)	4 (2)
2. Neurasthenia	128 (64)	38 (19)	34 (17)
3. Gassed	133 (79.6)	31 (18.6)	3 (1.0)
4. Nurses	0	0	73 (100)
<i>World War Two</i>			
1. Effort syndrome	40 (59.7)	20 (29.8)	7 (10.5)
2. Psychoneurosis	141 (71)	45 (22.5)	13 (6.5)
3. Dyspepsia	56 (56)	33 (33)	11 (11)
<i>Korea/Malaya</i>			
1. Psychoneurosis	12 (80)	2 (13.3)	1 (6.7)
2. Dyspepsia	2 (40)	3 (60)	0
3. Effort syndrome	0	1 (100)	0
<i>Gulf War</i>			
Gulf-related illness	140 (35)	229 (57.3)	31 (6.7)
TOTAL	1,145	534	177

Figures in parentheses indicate percentages

3. Type of Unit

The samples have been analysed by type of unit, whether combatant, combat support and non-combatant (Table 5). Combat units, or teeth arms, comprise the infantry, artillery, cavalry/armour, engineers and signals. Combat support included those troops that provided vital services to those in the front line: drivers, cooks, paymasters, intelligence, education, and supplies. Non-combatant units were not expected to fight though were often exposed to combat and included medical services and unarmed pioneer or labour companies. These distinctions were drawn irrespective of the soldier's actual military experience. They reflect training and determine expectations once war has been declared.

It has been hypothesised that troops in supportive roles, often isolated or denied the protection of a close-knit group, are more prone to stress reactions, though typically

exposed to less intense fighting (Glass, 1973). At first sight, this does not appear to be confirmed by the findings as 92.3% of the Boer War samples were from combat units, 84.3% of the World War One groups and 70.3% of the World War Two samples. In August 1914, 92.8% of Britain's 500,000 regular army was composed of combat troops, while combat support units accounted for only 3.5% (*Statistics of the Military Effort*, 1922, 28). By November 1918, when the strength of the British army had risen to 3,759,470, the proportions had changed significantly in response to the increasingly technical nature of war and the need for a long logistics tail to supply mass armies: combat troops accounted for 74.9%, combat support 20.5% and non-combatant were 4.5% (Ibid., 231). The proportion of teeth arms in the Middle East Force, which fought in the Western Desert between 1942 and 1943, had fallen to 63% (James, 1955, 106). For the Boer War and World War One the percentages are not greatly at variance with the overall composition of the armed forces. Historically, combat-support units have grown absolutely and as a proportion as war has become more technical and the medical and other services have improved. The Gulf War sample showed a distinct difference from the earlier pattern as only 53.8% were from combat units and 32.5% from combat support. In practice, however, many regular combat troops in the Gulf were required to undertake support roles because of the greatly reduced size of the British army. The changing composition of the armed forces can explain only part of this phenomenon. Nevertheless, it is important to relate these findings to actual exposure to combat (Table 7).

Table 5 Units

War - Disorder	All Units		
	Combat	Combat support	Non-combat
<i>Victorian campaigns</i>			
1. Cardiac	18 (94.7)	0	1 (5.3)
2. Debility	7 (77.8)	1 (11.1)	1 (11.1)
<i>Boer War</i>			
1. DAH	184 (92)	8 (4)	8 (4)
2. Rheumatism	185 (92.5)	5 (2.5)	10 (5)
<i>World War One</i>			
1. DAH	173 (86.5)	20 (10)	7 (3.5)
2. Neurasthenia	164 (82)	28 (14)	8 (4)
3. Gassed	152 (91)	9 (5.4)	6 (3.6)
4. Nurses	0	0	73 (100)
<i>World War Two</i>			
1. Effort syndrome	41 (61.2)	22 (32.8)	4 (6)
2. Psychoneurosis	154 (77)	40 (20)	6 (3)
3. Dyspepsia	72 (72)	24 (24)	4 (4)
<i>Korea/Malaya</i>			
1. Psychoneurosis	10 (66.7)	4 (26.7)	1 (6.6)
2. Dyspepsia	2 (40)	3 (60)	0
3. Effort syndrome	1 (100)	0	0
<i>Gulf War</i>			
Gulf-related illness	215 (53.8)	130 (32.5)	55 (13.7)
TOTAL	1,378	294	184

The combat units themselves have been analysed (Table 6). The majority of combat troops in the study were from infantry battalions, followed numerically by artillery - a reflection of the British Army's general structure. Although the proportion of men

from armoured units increased to around 7% during World War Two, they remained comparatively small when set beside the infantry and artillery. The Gulf War, which saw a major tank offensive, generated a significantly increased proportion from armoured units (15.3%).

Table 6 Combat Units

War- Disorder	Infantry	Artillery	Cavalry/ Armour	Engineers	Signals	TOTAL
<i>Victorian campaigns</i>						
1. Cardiac	16 (88.8)	1 (5.6)	1 (5.6)	0	0	18
2. Debility	3 (42.9)	1 (14.3)	2 (28.6)	1 (14.2)	0	7
<i>Boer War</i>						
1. DAH	147 (80)	11 (6)	22 (12)	4 (2)	0	184
2. Rheum.	145 (78.4)	11 (5.9)	25 (13.5)	4 (2.2)	0	185
<i>World War One</i>						
1. DAH	128 (74)	26 (15)	2 (1)	17 (10)	0	173
2. Neur	116 (70.8)	27 (16.5)	5 (3)	16 (9.7)	0	164
3. Gassed	104 (68.4)	32 (21.0)	1 (0.6)	15 (10.0)	0	152
<i>World War Two</i>						
1. Effort	18 (44)	13 (31.7)	3 (7.3)	7 (17)	0	41
2. Psych	90 (58.4)	34 (22)	9 (5.9)	12 (7.8)	9 (5.9)	154
3. Dyspepsia	36 (36)	18 (25.4)	4 (5.6)	11 (15.5)	3 (4.2)	72
<i>Korea/Malaya</i>						
1. Effort	0	0	0	1 (100)	0	0
2. Psych	4 (40)	5 (50)	0	0	1 (10)	10
3. Dyspepsia	1 (50)	1 (50)	0	0	0	2
<i>Gulf War</i>						
Gulf-related illness	77 (35.8)	50 (23.3)	33 (15.3)	40 (18.6)	15 (7.0)	215
TOTAL	885	230	107	128	28	1,378

4. Combat Exposure

Units and their deployment were researched to discover whether servicemen were exposed to combat irrespective of their training and branch (Table 7). Given the mobile and widespread nature of the fighting, it was not surprising to find that most of the Boer War veterans (77%) had seen action. Only 57% of the DAH pensioners in World War One had been in combat. The percentage for the neurasthenic group was higher (70%) because many had originally been treated for shell shock, a diagnosis not formally recognised by the Ministry of Pensions. However, 26% of this group and 37.5% of the DAH sample had never seen action, many having broken down in training in the UK. The proportions that had seen combat in World War Two were slightly lower: 46.3% of the effort syndrome sample, 41% of the dyspepsia group and 59% of psychoneurosis (a sample which included a number of men that had suffered from battle exhaustion). Nevertheless, the Gulf War sample had the lowest percentage of troops exposed to combat (19.8%). Unit diaries permitted accurate identification of the nature of operations that each individual had been engaged.

Most of those with Gulf-related illnesses had served at bases either in Kuwait or Saudi Arabia or had operated in the rear of advancing forces.

Table 7 Combat Exposure

War -Disorder	Combat exposure		
	In combat	No combat	Not known
<i>Victorian campaign</i>			
1. Cardiac	18 (94.7)	1 (5.3)	0
2. Debility	6 (66.7)	1 (11.1)	2 (22.2)
<i>Boer War</i>			
1. DAH	155 (77.5)	5 (2.5)	39 (20)
2. Rheumatism	153 (76.5)	7 (3.5)	40 (20)
<i>World War 1</i>			
1. DAH	114 (57)	75 (37.5)	11 (5.5)
2. Neurasthenia	140 (70)	53 (26.5)	7 (3.5)
3. Gassed	162 (97.6)	4 (2.4)	1 (0.01)
<i>World War 2</i>			
1. Effort syndrome	31 (46.3)	36 (53.7)	0
2. Psychoneurosis	119 (59.5)	71 (35.5)	10 (5)
3. Dyspepsia	41 (41)	50 (50)	9 (9)
<i>Korea/Malaya</i>			
1. Psychoneurosis	3 (20)	9 (60)	3 (20)
2. Dyspepsia	1 (20)	3 (60)	1 (20)
3. Effort syndrome	1 (100)	0	0
<i>Gulf War</i>			
Gulf related illness	79 (19.8)	271 (67.8)	50 (12.5)
TOTAL	1,036	646	174

As regards reported exposure to specific traumas, explosions were the most common, followed by wounds (Table 8). Other traumas included vehicle and training accidents, together with effects of air raids.

Table 8 Combat exposures

War – disorder	Gas attack	Explosion	Burial	Wound	Fire attack	Other
<i>Victorian campaign</i>						
1. Cardiac	0	0	0	2	1	0
2. Debility	0	0	0	1	0	1
<i>Boer War</i>						
1. DAH	0	0	0	8	1	7
2. Rheum	0	0	0	14	2	8
<i>World War 1</i>						
1. DAH	4	12	7	31	2	5
2. Neur.	6	83	28	39	9	8
3. Gassed	167	12	6	49	7	14
Nurses						
4. Neur	0	5	0	1	1	8
5. DAH	0	0	0	0	0	3
<i>World War 2</i>						
1. Effort	3	16	5	9	4	3
2. Psych	0	89	5	43	22	42
3. Dysp	0	10	1	6	2	7
<i>Korea/Malaya</i>						
1. Psych	0	0	0	4	0	3
2. Dysp	0	0	0	0	0	2
<i>Gulf War</i>						
Gulf-related illness	1	23	0	4	50	223
TOTAL	181	250	52	211	101	334

5. Marital Status

Most of the servicemen from all the wars were married either at the time of their service or shortly afterwards (Table 9). Most of the Boer War servicemen were single on enlistment but being regulars had married by the time they were discharged and applied for a pension. The lower proportion for World War One (58%), was a reflection of the youthfulness of the volunteers and conscripts.

Table 9 Marital Status

War – Disorder	Marital Status		
	Single	Married	Not known
<i>Victorian campaigns</i>			
1. Cardiac	2	17	0
2. Debility	0	9	0
<i>Boer War</i>			
1. DAH	29 (14)	166 (83.5)	5 (2.5)
2. Rheumatism	14 (7)	169 (84.5)	17 (8.5)
<i>World War One</i>			
1. DAH	75 (37.5)	113 (56.5)	12 (6)
2. Neurasthenia	62 (31)	119 (59.5)	19 (9.5)
3. Gassed	63 (37.7)	86 (51.5)	18 (10.8)
Nurses			
4. DAH	6 (25)	6 (25)	12 (50)
5. Neurasthenia	30 (61.2)	10 (20.4)	9 (18.4)
<i>World War Two</i>			
1. Effort syndrome	4 (5.9)	61 (91)	2 (2.9)
2. Psychoneurosis	32 (16)	163 (81.5)	5 (2.5)
3. Dyspepsia	9 (9)	90 (90)	1 (1)
<i>Korea/Malaya</i>			
1. Psychoneurosis	5 (3.3)	10 (6.7)	0
2. Dyspepsia	3 (60)	2 (40)	0
3. Effort syndrome	0	0	1 (100)
<i>Gulf War</i>			
Gulf-related illness	92 (23)	302 (75.5)	6 (1.5)
TOTAL	426	1,323	107

6. Educational Status

Because qualifications and tests varied greatly over the hundred years of the study, it was decided to employ a simple classification (Table 10). The consequences of progressive educational reforms were apparent from the samples. Just over half of the two Boer War samples had no qualifications, while 54% of the World War Two psychoneurosis sample had passed exams at school. Neither the World War One nor the Gulf War records routinely provided information on educational attainment.

Table 10 Educational background

War – Disorder	No qualifications	School qualifications	University/ Professional	Vocational	Not known
<i>Victorian campaigns</i>					
1. Cardiac	9	10	0	0	0
2. Debility	3	6	0	0	0
<i>Boer war</i>					
1. DAH	125 (63)	62 (31)	0	0	13 (7)
2. Rheum.	105 (52.5)	83 (42)	0	0	12 (6)
<i>World War 1</i>					
1. DAH	1 (0.5)	6 (3)	1 (0.5)	0	191 (96)
2. Neurasth	3 (2)	11 (5.5)	3 (1.5)	0	183 (92)
3. Gassed	2 (1.5)	4 (2.4)	0	0	160 (95.8)
4. Nurses	0	0	0	73 (100)	0
<i>World War 2</i>					
1. Effort	11 (16.4)	19 (28.4)	2 (3)	1 (1.5)	34 (50.7)
2. Psych.	23 (12)	107 (54)	3 (1.5)	3 (1.5)	64 (32)
3. Dyspepsia	19 (19)	18 (18)	0	2 (2)	61 (61)
<i>Korea/Malaya</i>					
1. Psych.	4 (26.7)	7 (46.7)	0	1 (6.7)	3 (20)
2. Dyspepsia	1 (20)	1 (20)	0	0	3 (60)
<i>Gulf War</i>					
Gulf-related illness	19 (4.8)	46 (11.5)	5 (1.3)	5 (1.3)	325 (81)
TOTAL	325	380	14	86	1,051

7. Conduct and Discipline

Most pension files include conduct sheets and an assessment on discharge of a soldier's military character (Table 11). These records show that war syndromes are not associated with poor conduct. Indeed, many of those in the study had exemplary characters and had no charges for misconduct. Taking the two Boer War samples, 73% had committed no or a few minor offences, and for the two World War One groups the proportion was higher (80%). For the three World War Two samples the percentage was lower (55%) though this was in part a reflection of a significantly higher level of missing conduct sheets (38%). Equivalent records were not available for the Gulf War sample as access to personal files was denied, and it only proved possible to assess conduct in a few cases. Servicemen with post-combat syndromes have good disciplinary records.

Table 11 Military Conduct of Servicemen

War - Disorder	Exemplary	1 to 7 offences	8 or more offences	Chronic or serious offender	Not reported
<i>Victorian campaigns</i>					
1. Cardiac	2 (10.5)	13 (68.4)	4 (21.1)	0	0
2. Debility	4 (44.4)	4 (44.4)	0	1 (11.2)	0
<i>Boer War</i>					
1. DAH	53 (26.5)	102 (51)	37 (18.5)	2 (1)	6 (3)
2. Rheumatism	47 (23.5)	89 (44.5)	51 (25.5)	7 (3.5)	6 (3)
<i>World War 1</i>					
1. DAH	128 (64)	45 (22.5)	2 (1)	0	25 (12.5)
2. Neurasthenia	104 (52)	42 (21)	7 (3.5)	6 (3)	41 (20.5)
3. Gassed	64 (38.4)	47 (28.1)	4 (2.4)	5 (30)	47 (28.1)
4. Nurses	0	0	0	0	73 (100)
<i>World War 2</i>					
1. Effort syndrome	34 (50.7)	13 (19.4)	2 (3)	1 (1.5)	17 (25.4)
2. Psychoneurosis	36 (18)	58 (29)	10 (5)	7 (3.5)	89 (44.5)
3. Dyspepsia	34 (34)	27 (27)	2 (2)	1 (1)	34 (34)
<i>Korea/Malaya</i>					
1. Psychoneurosis	0	9 (60)	1 (6.7)	1 (6.7)	4 (26.6)
2. Dyspepsia	1 (20)	2 (40)	0	1 (20)	1 (20)
3. Effort syndrome	0	0	0	0	1 (100)
<i>Gulf War</i>					
Gulf-related illness	0	3 (0.7)	8 (2.)	20 (5.0)	369 (92.3)
TOTAL	509	454	128	52	713

8. Somatisation and Illness

a) Boer War

Since DAH, rheumatism, effort syndrome and non-ulcer dyspepsia are all hypothesised to involve somatisation, it was predicted that in some cases may have been preceded by an organic illness or physical injury. Servicemen faced with the prospect of combat and possible death, may have nurtured a wish to remain sick and unconsciously created somatic symptoms. It was decided to examine recovery rates following organic illness. Each serviceman's medical records were examined for hospital entries preceding the award of a pension for a war syndrome. Many soldiers who fought in the Boer War had been admitted to field hospitals with enteric fever or dysentery. Indeed, physicians at the time believed that a causal link existed between rheumatic fever and valvular disease of the heart (VDH) in adults. Today, cardiologists have established that organic heart disease is unlikely to follow rheumatic fever in individuals over sixteen. All cases of VDH, which showed any sign of organic pathology, were examined by a consultant cardiologist, Dr Stephen Holmberg, before being included in the study. Some cases of VDH were diagnosed largely because the serviceman had suffered from 'simple continued fever' when in South Africa. In acute febrile illness the hyperdynamic circulation can produce a systolic murmur, which in the late nineteenth century physicians often misinterpreted as a sign of an organic lesion.

b) World War One

The trenches of World War One were insanitary and trench fever was commonplace. The influenza pandemic of 1918 affected large numbers of soldiers. Sir James Mackenzie argued from a survey of over 2,000 soldiers with DAH that in 80% of cases the 'first onset of their illness began with some complaint of an infectious nature, such as measles, influenza, trench fever, typhoid fever, malaria, dysentery or PUO' (Mackenzie, 1920, 534). Having found that 32% of his 558 patients with DAH had suffered from an infectious disease immediately before the onset of cardiac symptoms, Lewis concluded that this was 'the dominant etiological factor' (Lewis, 1918, 33). Furthermore, J.A. Venning analysed 7,803 DAH and VDH cases admitted to No. 1 Convalescent Depot between November 1916 and November 1918 (Venning, 1919, 337-38). He found that infection was the precipitating factor in 21.5% of cases - of which rheumatic fever was the most common complaint (50.3%) followed by PUO (16.3%). Interestingly, Venning believed that the 'physical and mental strain' of active service was the principal cause accounting for 28.2% of cases. 'It was impossible in many cases to distinguish whether the strain was mental or physical, the symptoms produced being identical... The effects of this were clearly shown by the large number of admissions after the German push towards Amiens in March and April 1918' (Ibid., 338).

Between 1880 and the 1930, the observation that neurasthenia frequently followed infection was widely held. For most physicians, including Osler, Oppenheim, Cobb, Horder and others, the principle candidate was influenza, but claims were also made for various alimentary bacteria, typhoid and even the effects of vaccination (Wessely, 1991, 927).

c) World War Two

In June 1941, Dr Paul Wood explored the relationship between infection and the onset of so-called effort syndrome (1941c, 847). Of the 225 cases that he studied, 17 had been preceded by rheumatic fever, influenza, pneumonia and other fevers, while a further 29 had been aggravated by infection. However, Wood discovered that a greater number had been preceded by a traumatic event, including gassing, explosion, concussion or injury. 'The chief factor', he concluded, 'was the belief, induced by the doctor, that the heart had been injured by the infection... It is therefore not surprising that rheumatic fever heads the list of these infections; influenza may come second because of the fallacious belief that it, too, injures the heart and because of its notorious influence on morale' (1941c, 847).

Taking the Boer War samples, 36% of DAH cases and 19% of rheumatism had a physical illness before being diagnosed with these disorders (Table 12). For the World War One samples, 45% of DAH and 40% of neurasthenia had a preceding physical illness. Similar percentages were recorded for effort syndrome (33%) and psychoneurosis (41%) during World War Two. These figures may understate the true incidence as a number of cases that had been preceded by treatable malaria were excluded to be certain that symptoms were not the result of a further episode. The dyspepsia sample had a much higher incidence (83%) because many subjects had been admitted for suspected duodenal ulcer, while others were diagnosed with gastritis or duodenitis in the absence of x-ray evidence for peptic ulcer. Although the GVMAP physicians elicited medical histories for all the Gulf War veterans, detailed records were not made available to us, which may account for low proportion (8%).

Table 12 Physical Illness before war pension

War - Disorder	Physical Illness	No Illness reported	Not known
<i>Victorian campaigns</i>			
1. Cardiac	14 (73.7)	5 (26.3)	0
2. Debility	7 (77.8)	2 (22.2)	0
<i>Boer War</i>			
1. DAH	81 (40.5)	119 (59.5)	0
2. Rheumatism	77 (38.5)	123 (61.5)	0
<i>World War One</i>			
1. DAH	90 (45)	110 (55)	0
2. Neurasthenia	79 (39.5)	119 (59.5)	2 (1)
3. Gassed	22 (13.2)	120 (71.9)	25 (14.9)
<i>Nurses</i>			
4. DAH	12 (50)	12 (50)	0
5. Neurasthenia	8 (16.3)	41 (83.7)	0
<i>World War Two</i>			
1. Effort	22 (32.8)	45 (67.2)	0
2. Psychoneurosis	82 (41)	117 (58.5)	1 (0.5)
3. Dyspepsia	83 (83)	15 (15)	2 (2)
<i>Korea/Malaya</i>			
1. Psychoneurosis	3 (20)	9 (60)	3 (20)
2. Dyspepsia	1 (20)	3 (60)	1 (20)
3. Effort syndrome	0	1 (100)	0
<i>Gulf War</i>			
Gulf-related illness	32 (8)	242 (61)	0
TOTAL	660	1,112	84

If those servicemen who sustained a wound are added to those that suffered from a physical illness then the proportions rise further (Table 13). During World War One it was argued that wounded servicemen 'appear to be comparatively immune to shell shock' and 'though some may show a slight degree of nervous exhaustion this is usually a late development, manifesting itself when the wound condition is such that a return to the front becomes a factor to be reckoned with' (Wiltshire, 1916, 1208). Although wounds may initially have served as a protector against shell shock, once recovery was underway some soldiers developed new symptoms or found that progress came to a halt. This evidence suggests that wounds, like physical illness, can serve as a precipitating factor in those particularly susceptible to post-combat syndromes. Indeed, in 1918 Lewis had found that for 63 cases (11%) of DAH the functional cardiac symptoms had been precipitated by wounds, bombardment, gassing or frostbite (Lewis, 1918, 33).

Table 13 Physical Illness and Wounds before Pension

War – Disorder	Illness and or Wound
<i>Victorian Campaign</i>	
1. Cardiac	16 (84.2)
2. Debility	7 (77.8)
<i>Boer War</i>	
1. DAH	85 (42.5)
2. Rheumatism	86 (43)
<i>World War One</i>	
1. DAH	103 (51.5)
2. Neurasthenia	102 (51)
3. Gassed	72 (43.1)
Nurses	
4. DAH	13 (54.2)
5. Neurasthenia	20 (40.8)
<i>World War Two</i>	
1. Effort syndrome	31 (46.3)
2. Psychoneurosis	113 (56.5)
3. Dyspepsia	89 (89)
<i>Korea/Malaya</i>	
1. Psychoneurosis	8 (47.1)
2. Dyspepsia	5 (100)
3. Effort syndrome	0
<i>Gulf War</i>	
Gulf-related illness	NA

10. Demobilisation and Employment

What, then, happened to servicemen with post-combat syndromes once they had been discharged from the army and had been awarded a war pension? Their files were examined to discover how many were able to return to paid employment and how many were so disabled by their symptoms that they were not offered jobs or felt obliged to resign once in post (Table 14). Some 77% of Boer War veterans in the two samples returned to paid employment, while 22% were either unable or unwilling to work. The proportion that were known to have gone back to employment after World War One was noticeably lower (46%). This was in part a function of nature of war pension files, which did not systematically record a veteran's work status. Despite the harsh economic climate of the 1920s and the deep post-war depression, only 4% were known not to be able to work. Under pressure from MPs and veterans' pressure groups, the Ministry of Pensions introduced re-training schemes for ex-servicemen, who were also given priority by some employers. The vast majority of veterans from the World War Two samples (80%) returned to jobs after 1945. Similarly, most of the Gulf population (63%) were either employed in civilian life or continued to serve in the army. Only 8% were definitely unable to work.

Table 14 Work after discharge

War – Disorder	Working	Not working	Not known
<i>Victorian campaigns</i>			
1. Cardiac	6 (66.6)	0	3 (33.4)
2. Debility	18 (94.7)	0	1 (5.3)
<i>Boer War</i>			
1. DAH	154 (77)	43 (21.5)	3 (1.5)
2. Rheumatism	153 (76.5)	46 (23)	1 (0.5)
<i>World War One</i>			
1. DAH	89 (44.5)	8 (4)	103 (51.5)
2. Neurasthenia	95 (47.5)	7 (3.5)	98 (49)
3. Gassed	49 (29.3)	30 (18.0)	88 (52.7)
Nurses			
4. DAH	7 (29.2)	9 (37.5)	8 (66.7)
5. Neurasthenia	16 (32.7)	20 (40.8)	13 (26.5)
<i>World War Two</i>			
1. Effort syndrome	56 (83.6)	3 (4.5)	8 (11.9)
2. Psychoneurosis	154 (77)	11 (5.5)	35 (17.5)
3. Dyspepsia	85 (85)	2 (2)	13 (13)
<i>Korea/Malaya</i>			
1. Psychoneurosis	9 (60)	1 (6.7)	5 (33.3)
2. Dyspepsia	5 (100)	0	0
3. Effort syndrome	1 (100)	0	0
<i>Gulf War</i>			
Gulf-related illness	253 (63.3)	30 (7.5)	117 (29.3)
TOTAL	1,150	210	496

11. Attributions for Ill Health

How, then, did servicemen themselves explain these post-combat syndromes? Attributions appear to be culturally conditioned and varied across the century, tied to prevailing health beliefs and concerns (Table 15). Applicants for a war pension were required to state what they thought was the cause of their disability. In the main, there were six categories of explanation:

1. That symptoms were the result of a physical illness acquired while in the army.
2. That symptoms were the result either of a physical injury or the physical strain of campaigning (marching, sleeping on hard ground, completing assault courses).
3. That symptoms were the result of an adverse climate (wet and cold in South Africa) or environment (the heat of the Western desert or monsoon jungle of Burma).
4. That symptoms were the result of a toxic exposure: either to gas in World War One, or chemical and biological weapons or depleted uranium ordnance in the Gulf War.
5. That symptoms were the result of psychological stress caused by combat or the prospect of combat.
6. That symptoms were the result of psychological stress caused by distance from family and friends or particular home worries.

Table 15 Servicemen's attributions

War - Disorder	Physical illness	Injury or physical strain	Climate - environment	Toxic exposure	Psychological stress service	Psychological stress domestic	Not reported
<i>Victorian campaigns</i>							
1. Cardiac	0	4 (21)	2 (10.5)	0	0	0	8 (42.2)
2. Debility	5 (26.3)	2 (22.2)	3 (33.3)	0	0	0	4 (44.5)
<i>Boer War</i>							
1. DAH	51 (25.5)	49 (24.5)	22 (11)	0	2 (1)	0	76 (38)
2. Rheum	35 (17.5)	30 (15)	74 (37)	0	2 (1)	0	59 (29.5)
<i>World War 1</i>							
1. DAH	35 (17.5)	90 (45)	12 (6)	3 (1.5)	8 (4)	0	52 (26)
2. Neur	11 (5.5)	85 (42.5)	4 (2)	3 (1.5)	68 (34)	1 (0.5)	28 (14)
3. Gassed	1 (0.5)	12 (7.2)	0	141 (84.95)	2 (1.2)	0	11 (6.6)
<i>Nurses</i>							
1. DAH	9 (37.5)	8 (33.3)	2 (8.3)	0	0	0	5 (20.9)
2. Neur	10 (20.4)	20 (40.8)	3 (6.1)	0	6 (12.2)	2 (4.0)	8 (16.5)
<i>World War 2</i>							
1. Effort	5 (7.5)	25 (37.3)	5 (7.5)	1 (1.5)	14 (20.9)	6 (9)	11 (16.3)
2. Psych.	9 (4.5)	65 (32.5)	7 (3.5)	1 (0.5)	82 (41)	10 (5)	26 (13)
3. Dyspepsia	12 (12)	44 (44)	10 (10)	0	5 (5)	0	29 (29)
<i>Korea/ Malaya</i>							
1. Psych	2 (13.3)	3 (15)	1 (6.7)	0	2 (13.3)	5 (33.4)	2 (13.3)
2. Dyspepsia	0	3 (60)	0	0	0	1 (20)	1 (20)
3. Effort	0	1 (100)	0	0	0	0	0
<i>Gulf War</i>							
Gulf related illness	1 (0.3)	9 (2.2)	0	137 (34.3)	33 (8.3)	2 (0.5)	218 (54.5)
TOTAL	186	450	145	286	224	27	538

a) Boer War

The study shows that Boer War servicemen diagnosed with DAH generally believed it to be the result of either physical illness (26%) or of physical exertion (25%). Private Isaac Booker of the Devonshire Regiment, who had been awarded a permanent pension for DAH, wrote: 'my complaint is rather a hard one to fight against, the heart being affected, which is often the cause of me not being able to work for 3 to 4 days together' (PRO, PIN71/1484). Sent to the Mooi River by a forced march, he found himself short of breath and so exhausted that a comrade had to carry his rifle. Booker was subsequently invalided home after a hospital admission. The official medical explanation for DAH was that tight webbing constricted the flow of blood to and from the heart when soldiers were marching, while rheumatic fever was identified as the cause of valvular disease of the heart. Rheumatism was popularly believed to be caused by soaking and sleeping in wet clothes, an explanation adopted by 37% of the sample, while physical illness, enteric fever or dysentery, accounted for a further 18%. Sapper Joseph Woodward of the Royal Engineers, who had fought at the battle of Paardeburg and the relief of Kimberley, caught enteric fever which was followed by rheumatism in his back and legs. He recalled 'the doctor told me that I was out of danger and the sooner I was out of the country the better as the rainy season was coming on' (PRO, PIN71/1003).

b) World War One

A different pattern emerged in World War One with physical exertion accounting for 45% of the DAH sample and 43% of the neurasthenia group. The demands of trench warfare (the appalling conditions in winter, insanitary state and poor food) were considered by many to have caused damage to the heart or central nervous system. For example, Sapper Alfred Avery of the Royal Engineers wrote that DAH followed fourteen months active service in France: 'from March 1918 onwards during the German offensive in retreating from Ham to Pont Remy sleep was scarce and fatigues very heavy and I found difficulty going to work. Ultimately in October 1918 on complaining to the MO, I was excused from heavy fatigues' (PRO, PIN26/673).

However, a significant number of neurasthenic pensioners (34%) attributed their symptoms to the psychological stress of military service. They had, perhaps, been educated by psychologically-minded physicians and the gradual incursion of psychological texts into medical and general literature. 2nd Lieutenant Paul Marsland of the Northumberland Fusiliers, who was dazed by a shell burst in March 1918 during the German offensive, collapsed with exhaustion and shakiness. Diagnosed with neurasthenia, he was awarded a 30% pension in August 1918. Showing little sign of recovery, Marsland was referred to a Ministry of Pensions psychotherapy clinic in June 1923 where after eight sessions he had improved sufficiently to return to work and his pension was ended (PIN26/22084).

c) World War Two

World War Two saw this process continue and 41% of the psychoneurosis sample attributed their symptoms to psychological stress arising from military service and a further 5% to stresses related to their domestic situation. By contrast, 44% of the dyspepsia population, who had plausibly somatised emotional conflict, attributed their symptoms to the physical exertions of training and active service. The effort syndrome sample was divided between those who sought a physical explanation (36%) and those that believed psychological stress was the cause (20%). Following Wood's pioneering work at Mill Hill Hospital, cardiologists were encouraged to refer patients with functional symptoms to psychiatrists for treatment that sometimes involved re-education (Jones, 1952).

d) Gulf War

Psychological explanations were significantly absent from the Gulf War sample - only 9% believed that stress played a causal role. Although over half of the population did not volunteer reasons for their symptoms, 34% thought that their condition was the result of toxic exposure. These results seem to show a sharp retreat from the trend of the earlier years of the century towards greater psychological understanding and a willingness to balance competing explanations.

12. Pension Awards

Finally, the pensions themselves were analysed to discover whether significant differences could be detected both in the types of award and the amounts granted (Table 16). Under the pre-1914 Royal Hospital system virtually all pensions were permanent. After a short conditional period when a veterans' medical state was monitored, an attributed award was granted and the percentage related to reflect the extent to which a man's ability to earn a wage was impaired. Although recipients were on occasion required to attend further medical boards, it was rare for a

permanent pension to be reduced even if the man showed signs of improvement. The disorder itself was considered less important than the extent to which a veteran was incapacitated. An ex-serviceman with neurasthenia, for example, who was incapable of leaving his bed, would be granted a 100% pension, while a man who had a contracture of the arm as a result of a gunshot wound, but who could still work, might only receive 25%.

The Royal Hospital system appeared to be relatively generous to ex-servicemen if they could persuade military physicians that they deserved a pension. An aggravated award was converted to an attributed one after several boards if the disability endured. Once a permanent pension had been established, it was not withdrawn except when a veteran committed a civil offence and was imprisoned. The Royal Hospital dealt with relatively small numbers and the majority of applicants were regulars. Both DAH and rheumatism attracted moderate awards (56% and 59% respectively).

From 1917, the Ministry of Pensions operated a different system. Servicemen were examined to ascertain whether the disability was wholly the consequence of military service (attributed) or whether an existing disorder had been made worse by service (aggravated). Attributed pensions could be paid for life. Aggravated awards were usually short lived and terminated when the effect of war was deemed to have passed. The actual amount awarded was determined by a schedule based on actual physical damage. The loss of a two or more limbs entitled a man to 100%, whereas amputation of a leg above the knee was assessed at 60% and below the knee was 50% (*First Annual Report of the Ministry of Pensions*, 1919, 90-91). Shell shock, a disorder without objective clinical signs, was more difficult to categorise. In April 1918, a sub-committee of the Council of consultants, chaired by Frederick Treves, argued that shell shock should be classified either as a severe injury (where recovery was expected) or a very severe injury when the veteran was not expected to get better (PRO, WO32/2791). In practice, the award for shell shock or neurasthenia was between 20% and 40%.

Under pressure to make economies and faced with the discharge of a vast citizen army, the Ministry of Pensions preferred to make aggravated awards and converted attributed ones if the ex-serviceman showed any signs of improvement. Pensions in the DAH sample were granted at a lower rate (33%) than those in the neurasthenia/shell shock group (41%). DAH cases may have been treated less sympathetically because this was accepted as a functional disorder, while neurasthenia, or shell shock, was viewed as a direct consequence of being in action.

Table 16 War Pensions

War – Disorder	Attributed	Aggravated	Rejected	Not known	Initial award %
<i>Victorian Campaigns</i>					
1. Cardiac	16 (84.2)	1 (5.3)	0	2 (10.5)	NA
2. Debility	9 (100)	0	0	0	NA
<i>Boer War</i>					
1. DAH	190 (95)	10 (5)	0	0	56.3
2. Rheumatism	199 (99.5)	1 (0.5)	0	0	58.8
<i>World War One</i>					
1. DAH	136 (68)	63 (31.5)	1 (0.5)	0	33.3
2. Neurasthenia	163 (82)	33 (16.5)	4 (2.0)	0	41.1
3. Gassed	158 (94.6)	4 (2.4)	5 (3.0)	0	26.5
Nurses					
4. DAH	14 (58.4)	5 (7.1)	5 (20.8)	0	52.5
5. Neurasthenia	37 (75.5)	5 (20.8)	7 (17.4)	0	44.2
<i>World War Two</i>					
1. Effort syndrome	15 (22.4)	30 (44.8)	22 (32.8)	0	27.8
2. Psychoneurosis	47 (23.5)	106 (53)	47 (24)	0	22.3
3. Dyspepsia	41 (41)	41 (41)	18 (18)	0	22.5
<i>Korea/Malaya</i>					
1. Psychoneurosis	1 (6.7)	0	14 (93.3)	0	14.3
2. Dyspepsia	5 (100)	0	0	0	22.0
3. Effort syndrome	1 (100)	0	0	0	10
<i>Gulf War</i>					
Gulf-related illness	NA	NA	NA	NA	NA
TOTAL	1,032	299	123	2	-

NA - not available

World War Two saw the number of attributed awards fall dramatically as doctors were instructed to take the serviceman's pre-war constitution and medical history into account. In this way, it was very difficult to make a case for an attributed pension for any psychological disorder. Equally, it enabled doctors to reject many claims where the soldier had symptoms and could demonstrate a disability if it could be established that these effects were present before military service. Percentage awards also showed a reduction - only 22% for psychoneurosis and 28% for effort syndrome. Greater effort was made to treat servicemen before they left the forces or to find them duties that they could perform in an attempt to avoid the pension epidemic that followed World War One. This strategy was largely successful and is reflected in these results.

Although war pensions have been awarded to Gulf War veterans, we have not been granted access to these files.

STATISTICAL ANALYSIS

To supplement the statistical analysis contained in our Final Report (March 2001), the enlarged database has been re-analysed by Professor Brian Everitt using a more advanced version of cluster analysis.

Data set

The questionnaire (HMR) applied to the war pension files consisted of 94 possible symptoms. A large number of symptoms were included at the outset because we could not be certain which ones would be found when researching medical files from 1900 to the present. It was decided to spread the net as wide as possible. However, it is difficult to analyse so many variables using either cluster or factor analysis. As a result, they have been reduced in number. The entire data set was analysed to find the twenty-five most common symptoms. These were as follows:

1. Difficulty completing tasks
2. Fatigue, lethargy
3. Forgetfulness
4. Rapid or irregular heart beat
5. Shortness of breath
6. Stomach cramps and abdominal pain
7. Diarrhoea
8. Headaches
9. Tremor, shaking or trembling
10. Dizziness or giddiness
11. Pains in joints
12. Weakness
13. Back pain
14. Tenderness or soreness
15. Persistent cough
16. Heavy sweating
17. Depression or low mood
18. Irritability
19. Poor concentration
20. Persistent anxiety
21. Jumpiness or easily startled
22. Changes in personality
23. Difficulty in sleeping
24. Nightmares
25. Changes in weight

Cluster Analysis

Cluster analysis is a generic term for a wide range of techniques, which explore multivariate data for the presence of relatively distinct groups or clusters of observations. A comprehensive account of the topic is given in Everitt, Landau and Leese (2001). Because of the large number of observations (1,856), a k-means algorithm was used to cluster the data. For a given number of groups, this method

seeks to find a partition of the data and then minimises the pooled, within-cluster variance. Deciding on the most appropriate number of groups is a difficult problem and one without a completely satisfactory answer. Following a recent suggestion made by Tibshirani, Walther and Hastie (2001), the gap statistic was used. This resulted in the selection of the three-group solution for detailed interpretation. The three groups totalled 847 (45.6%), 434 (23.4%) and 575 (31%) cases.

Mean profiles

The mean profiles of the three groups based on the 25 most common symptoms are shown in Figure 1. They suggest that the groups can be characterised in the following ways (Figure 1).

a) Group One (n = 847)

The following four symptoms were prominent: difficulty completing tasks, fatigue shortness of breath and weakness. Moderately represented were rapid heartbeat, tremor, headaches, dizziness, pains in joints, difficulty sleeping, changes in weight and anxiety. Psychological symptoms, such as depression, memory impairment, irritability and poor concentration were notably absent. The clustering of symptoms is indicative of a chronic fatigue syndrome with associated physical symptoms. Cases are not drawn from any particular war (Table 17), though 74% of subjects came from wars fought before 1918; only 36% are from World War Two and after. As regards diagnosis, 30% had been categorised as DAH and 20% with rheumatism (Table 19).

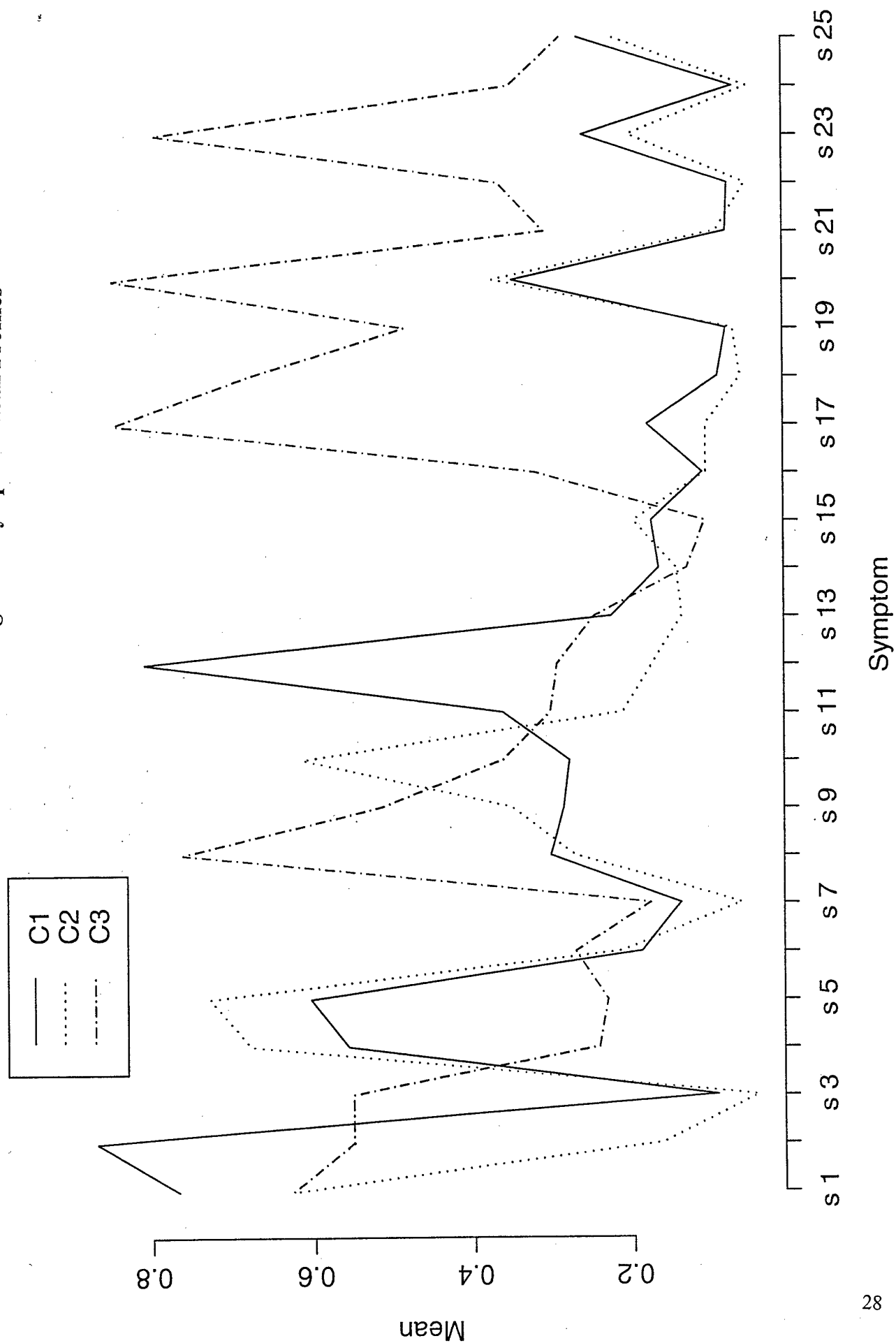
b) Group Two (n = 434)

Prominent symptoms for this group were: rapid heartbeat, shortness of breath, fatigue and dizziness. Moderately represented were: difficulty completing tasks, headaches, tremor and anxiety. These symptom clusters are indicative of a functional cardiac syndrome, though curiously the group represents only 39% of all DAH cases and 44% of effort syndrome cases. Subjects are drawn from all diagnostic categories. World War One servicemen comprise 49% of the group, a conflict that was dominated by functional cardiac disorders. Relatively few World War Two (22.6%) and Gulf War servicemen (9.5%) fell into this group.

c) Group Three (n = 575)

Prominent symptoms for this group were: fatigue, headaches, depression, anxiety and difficulty sleeping. Moderately represented were: difficulty completing tasks, forgetfulness, rapid heartbeat, shortness of breath, tremor, dizziness, weakness, pains in joints, back pain, sweating, irritability, poor concentration, jumpiness, changes in personality, nightmares and weight change. Although this cluster has somatic symptoms, it is characterised by a range of psychological features. This is reflected in its composition by diagnosis. Over half of the 200 cases of neurasthenia/shell shock are to be found in this group, together with 84% of the psychoneurosis sample. Interestingly, 54% of those with Gulf-related illness also fell into this group.

Figure 1 Symptom Mean Profiles



The three groups may be classified as follows:

Group One – a chronic fatigue syndrome.

Group Two – a somatic syndrome focused on the heart.

Group Three – a psychological syndrome with a range of associated somatic symptoms.

Cross-classification against other variables

Cluster membership was cross-classified against other variables such as war, gender rank, unit, diagnosis, combat exposure and attribution.

By war

A logistic regression with cluster as the dependent variable and the remaining variables as explanatory identified war as overwhelmingly the best predictor of variance within the population (Table 17). Simplifying the results, it can almost be argued that Group One represents Victorian campaigns, the Boer War and World War One. Group Two represents World War One with subsidiary elements drawn from the Boer War and World War Two, while Group Three stands for World War Two, Korea/Malaya and the Gulf War. This suggests that there is an important temporal element running through these post-combat syndromes. They appear, therefore, to be influenced by the changing nature of war, state of medical knowledge and cultural shifts.

Table 17 War

Group/War	Victorian campaigns	Boer War	World War One	World War Two	Korea/Malaya	Gulf
One	23 (2.7)	308 (36.7)	292 (34.5)	76 (9.0)	2 (0.2)	146 (17.2)
Two	4 (0.9)	91 (21.0)	213 (49.1)	83 (19.1)	5 (1.2)	38 (8.8)
Three	1 (0.2)	1 (0.2)	135 (23.5)	208 (36.2)	15 (2.6)	216 (37.6)

(Pearson's chi-square test without Yates's continuity correction: x-square = 523, df = 10, p-value = 0).
Figures in brackets indicate percentages.

By gender

Women are distributed between the three groups (61.8%, 13.5% and 24.8% respectively) in roughly in the same proportions as men. This suggests that gender does not exert a powerful effect on the presentation and form of post-combat syndromes.

Table 18 Gender

Group/Gender	Male	Female
One	792 (93.5)	55 (6.5)
Two	422 (97.2)	12 (2.8)
Three	553 (96.2)	22 (3.8)

(x-square = 10, df = 2, p-value = 0.005).

By Diagnosis

Because diagnosis tends to follow changes in medical knowledge and cultural developments, the temporal pattern identified in the analysis by war is also apparent from this variable (Table 19). For example, functional cardiac disorders (DAH and effort syndrome) were little understood until World War One and had been a major cause of discharge from the British army. Group one has 57.3% of cases, group two 39.1% and group three 3.5%. By comparison, psychological disorders (neurasthenia and psychoneurosis), which became increasingly recognised as the twentieth century progressed, are distributed as follows: group one 22.2%, group two 3.7% and group three 67%. Diagnostic classification is reflected in the temporal basis of the clustering.

Table 19 Diagnosis

Group/Diagnosis	Cardiac	Debility	DAH	Rheumatism	Neurasthenia	Gassed	Psychoneurosis	Effort syndrome	Dyspepsia	Gulf-related illness
One	15 (1.8)	8 (0.9)	255 (30.1)	173 (20.4)	86 (10.2)	86 (10.2)	17 (2.0)	23 (2.7)	38 (4.5)	146 (17.2)
Two	4 (0.9)	0 (0)	166 (38.2)	26 (6.0)	33 (7.6)	79 (18.2)	17 (3.9)	30 (6.9)	41 (9.4)	38 (8.8)
Three	0 (0)	1 (0.2)	3 (0.5)	1 (0.2)	130 (22.6)	2 (0.3)	181 (31.5)	15 (2.6)	26 (4.5)	216 (37.6)

(x-square = 796, df = 16, p-value = 0).

Rank

Other ranks and NCOs are distributed broadly in proportion with the dimensions of the three groups (Table 20). However, officers are overly represented in group three (45%) and under represented in group two (11.5%). This may be a function of education and a greater willingness to acknowledge psychological symptoms.

Table 20 Military Rank

Group/Rank	Officers	NCOs	Other Ranks	Nurses
One	45 (5.3)	228 (26.9)	527 (62.2)	47 (5.5)
Two	12 (2.8)	113 (26.0)	298 (68.7)	11 (2.5)
Three	47 (8.2)	193 (33.6)	320 (55.7)	15 (2.6)

(x-square = 37, df = 6, p-value = 0).

Type of unit

Non-combatant and combat soldiers are distributed in proportion between the three groups (Table 21). By comparison, combat-support servicemen are over represented in group three (45.1%) and under represented in group one (33.8%). This is probably a feature of the increasingly technical nature of warfare. Group three is mainly composed of servicemen drawn from World War Two to the Gulf when armies required increasingly complex logistics systems.

Table 21 Type of Unit

Group/Type of unit	Non-combat	Combat	Combat-support
One	106 (12.5)	642 (75.8)	99 (11.7)
Two	31 (7.1)	341 (78.6)	62 (14.3)
Three	47 (8.2)	396 (68.9)	132 (23.0)

(x-square = 43, df = 4, p-value = 0).

Type of recruit

Regular troops were proportionately distributed between all three groups (Table 22). Reservists (46.9%) and territorials (47.1%) were disproportionately represented in group three probably because a greater proportion of reservists and territorials were called for active service during World War Two and the Gulf.

Table 22 Type of Recruit

Group/Recruit	Regular	Reserve	Territorial	Volunteer	Conscript	Militia
One	450 (53.1)	24 (2.8)	39 (4.6)	196 (23.1)	118 (13.9)	20 (2.4)
Two	146 (33.6)	19 (4.4)	35 (8.1)	120 (27.6)	111 (25.6)	3 (0.7)
Three	245 (42.6)	38 (6.6)	66 (11.5)	87 (15.1)	139 (24.2)	0

(x-square = 122, df = 10, p-value = 0).

Exposure to combat

Actual experience of combat does not appear to distinguish between the groups (Table 23). The numbers of those engaged in fighting are in proportion to the group sizes.

Table 23 Exposure to Combat

Group/Combat exposure	Exposed to combat	No combat	Not recorded
One	499 (58.9)	255 (30.1)	93 (11.0)
Two	268 (61.8)	126 (29.0)	40 (9.2)
Three	267 (46.4)	259 (45.0)	49 (8.5)

(x-square = 35.3151, df = 2, p-value = 0).

Predisposing physical illness

About a third of all servicemen in each of the three groups had suffered from a physical illness before succumbing to a post-combat syndrome (Table 24). Predisposing physical illness is not a powerful discriminating variable.

Table 24 Physical Illness

Group/Illness	Illness	No illness	Not recorded
One	259 (30.6)	572 (67.5)	16 (1.9)
Two	154 (35.5)	270 (62.2)	10 (2.3)
Three	158 (27.5)	413 (71.8)	4 (0.7)

(x-square = 8.5, df = 2, p-value = 0.014).

Military conduct

Military conduct was not a powerful discriminatory variable between the three groups (Table 25). Most servicemen with exemplary or very good conduct records were distributed proportionately.

Table 25 Military Conduct

Group/Conduct	Exemplary	Very good	Fair	Poor	Not recorded
One	393 (46.4)	220 (26.0)	81 (9.6)	16 (2.8)	137 (16.2)
Two	188 (43.3)	125 (28.8)	28 (6.5)	13 (3.0)	80 (18.4)
Three	296 (51.5)	109 (19.0)	18 (3.1)	23 (4.0)	129 (22.4)

(x-square = 29.9118, df = 6, p-value = 0.0).

Attributions by servicemen

Finally, the attributions made by servicemen for their disorders broadly correlated with the symptom characteristics of the three groups (Table 26). For group one (fatigue disorder), the overwhelming majority believed that their illness was related to either a physical illness, physical injury/strain, climate or toxic exposure. For group two (somatic disorder), almost half attributed their symptoms to physical injury/strain or toxic exposure. By comparison, 143 (63.8%) of those who believed the psychological stress of military service was the cause of their illness came from group three. Equally, only 12.4% of those who believed that they were suffering from a physical illness were found in group three.

Table 26 Attributions

Group/Attribution	Physical illness	Physical injury	Climate	Toxic exposure	Military stress	Domestic stress	Not recorded
One	108 (12.8)	196 (23.1)	101 (11.9)	113 (13.3)	51 (6.0)	4 (0.5)	274 (32.3)
Two	55 (12.7)	119 (27.4)	30 (6.9)	91 (21.0)	30 (6.9)	5 (1.2)	104 (24.0)
Three	23 (4.0)	135 (23.5)	14 (2.4)	85 (14.8)	143 (24.9)	18 (3.1)	157 (27.3)

(x-square = 210, df = 10, p-value = 0).

Summary

Although there is a considerable degree of overlap, there appear to be three groups with the following characteristics:

Group one: a post-combat syndrome typified by chronic fatigue and prevalent during the late nineteenth century and World War One.

Group two: a somatic disorder with a focus on the heart typical of World War One though with less common representatives during the Boer War and World War Two.

Group three: a post-combat syndrome with psychological characteristics and associated somatic symptoms more typical of World War Two and the Gulf War.

General Findings

A survey of the symptomatology of war syndromes from the American Civil War to the present identified two features that suggested a common relationship: the similarity of reported symptoms, and the high frequency of reported diarrhoea and other infectious diseases preceding the onset of these syndromes (Hyams, Wignall & Roswell, 1996, 401-02). Furthermore, it was hypothesised that war syndromes can be categorised into two groups: those that are physiologically attributed (Irritable Heart, DAH, Effort syndrome, Agent Orange exposure and Gulf War syndrome) and those that had a psychological explanation (nostalgia, shell shock, battle fatigue and PTSD).

The addition of 240 further subjects, the use of an advanced of form cluster analysis and reducing the total number of symptoms have modified the findings of our earlier report (2001). Although they have elements in common, there appear to be three types of post-combat syndrome defined by their symptomatology. These, in turn, bear an important temporal relationship with specific conflicts.

When assessed by their characteristic symptoms, significant differences appear to have been detected between individual war syndromes. This implies that there is not a single war syndrome common to all modern wars. It appears that different varieties arise in response to changing circumstances. The form that these take is chiefly determined by the chronology of the associated war and therefore may be related to the nature of combat, contemporary medical knowledge and important health beliefs and fears. Because of servicemen from different time periods with different diagnoses occur in the same groups, it does not appear that there are a series of distinct war syndromes.

The second important finding is that in terms of its mean profile the Gulf War does not stand apart from the other conflicts. Nevertheless, it has does not have a straightforward profile. Just over half (54%) of the sample fell into group three characterised by psychological symptoms and associated with the post-1939 period. Yet group one, characterised by chronic fatigue, accounted for 36.5% of the sample, and this tends to be associated with Victorian campaigns, the Boer War and World War One. Only 9.5% were found in group two, the somatic post-combat syndrome with a focus on the heart.

QUESTION TWO: MORTALITY STUDY

In original the submission to the Department of Defense, it was stated that we would study the morbidity and mortality of veterans from World War One. We proposed a comparison of 700 ex-servicemen diagnosed with DAH/effort syndrome with 700 pensioners suffering from loss of limb. This study was changed for the following reasons.

Veterans with DAH rarely received a pension greater than 40% and more commonly 20% to 30%. Shell shock, or neurasthenia as it was reclassified in 1917, was regarded as equivalent to a severe wound, if likely to recover, or a very severe wound where the disability was likely to be permanent or prolonged (PRO, WO32/2791, 1917). Under the schedule drawn up in 1917, loss of two limbs entitled a serviceman to a pension of 100%, while the amputation of a single limb could carry an entitlement of 50% to 70% (*Ministry of Pensions, First Annual Report*, 1919, 90-91). As a result, it was decided to select men with minor gunshot wounds (GSW) as the control population. An obvious source were the war pension files in the PRO (PIN26). Because these are catalogued by name and disorder, 700 random cases of DAH could be easily selected. However, the percentage disability for the GSW cases can only be discovered by requesting and searching each individual file. It would be necessary to request at the very minimum 1,500 documents to find 700 pensioners with GSWs of 20-30%. In addition, these files rarely include detailed dates of birth. Most simply recorded a year, which in some cases was falsified by under-age recruits. Under financial constraints from government, the Ministry of Pensions withdrew most pensions in the 1920s and 1930s when the file was closed. As the veteran was still youthful, the documents very rarely contain a date of death. Indeed, of the 200 DAH cases in the symptom study, only 13 (6.5%) had details of when the servicemen died.

It is virtually impossible to find the date of death from the name alone. Death certificates are indexed alphabetically by year at the Family Records Centre (managed by the Public Record Office and Office for National Statistics). With no indication of when an ex-serviceman might have died, it is necessary to consult as many as 50 volumes with no certainty of finding the former pensioner. As a result, it was not possible to use the 200 DAH cases from the PIN26 holding in an investigation of mortality and morbidity.

Because DAH and neurasthenia are both functional disorders, they are not listed in national statistics as official causes of death. It is not possible, therefore, to approach the problem from an institutional direction rather than individual cases. The only way to discover more about the mortality of servicemen with war syndromes is to look at case records, which are problematical for the reasons given above.

At the DSS filestore in Nelson, Lancashire, we discovered an uncatalogued archive of 7,800 World War One pension files. These included all 13 regions of the UK and Ireland. The records are comprehensive, containing dates of birth, dates of death and in many cases death certificates. We randomly extracted two groups (DAH and neurasthenia/shell shock) together and equivalent number of GSWs matched by region, rank and level of disability. There are 139 cases of DAH/VDH and 126 of

neurasthenia/shell shock. Not all the files included death certificates and full dates of death. It was necessary to research these at the Family Records Centre and then to purchase death certificates from the General Register Office in Southport. This was added to an already time-consuming process, and in total 197 death certificates were bought at a total cost of £1,280.50.

Once these groups were examined in more detail, it became apparent that this is a sub-population. They represent the last World War One cases to be administered by the DSS and refer to the longest-lived veterans (with a small number who died earlier but whose widow was entitled to a pension). They are not representative of the entire World War One, pension population. They have been put into an Access database and coded using the 10 most common causes of death in the US in 1982: heart disease, cancer, accidents, stroke, chronic lung disease, suicide, pneumonia/influenza, chronic liver disease, diabetes mellitus, and other.

Given the problems with the World War One archives, it was also decided to undertake a mortality and morbidity investigation of Boer War pensioners. The sample of 200 cases of DAH/VDH from the symptom study was used as most of these files contained dates of birth and death and details of cause of death. A random selection of Boer War veterans with gunshot wounds was collected and matched by rank and level of disability on discharge. Although the population is representative in terms of geographical spread and non-commissioned ranks, it does not contain any officers. Like the Nelson sample, it is drawn from a long-lived group of pensioners. The average age at death of the DAH group (68.2 years) suggests that as servicemen died their files were destroyed, leaving a residual collection of the healthier ex-servicemen. It has to be emphasised that the two mortality studies, though not ideal in their design, are all that the surviving historical records will permit.

Statistical Analysis

(i) Boer War

From the pension files of the Royal Hospital, Chelsea, 200 randomly-selected cases of DAH/VDH were compared with 200 veterans with gunshot wounds matched by level of disability at first assessment. A Cox regression, a second Cox regression adjusted for matching and a Wilcoxon signed-rank test ($p = 0.182$) all suggested that there was no statistically significant difference in their rates of mortality (Table 27). Furthermore, a Pearson's correlation showed that there was no association between the assessed level of disability and age at death (-0.067 with 95% confidence limits of -0.204 to 0.072).

Table 27 Boer War DAH/VDH mortality study

	Hazard ratio	Standard error	Z	p	95% confidence interval
DAH/VDH	1.115	0.112	1.08	0.279	0.916 to 1.357
DAH/VDH adjusted	1.115	0.115	1.06	0.29	0.911 to 1.364

As regards cause of death, a simple cross tabulation of the DAH/VDH cases and their controls showed no obvious pattern of difference (Table 28).

Table 28 Cause of death for the Boer War DAH/VDH cohort

Cause of death	DAH/VDH (n = 200)	GSW (n = 200)
Heart disease	83 (41.5)	70 (35.0)
Cancer	24 (12.0)	27 (13.5)
Accident	1 (0.5)	3 (1.5)
Stroke	13 (6.5)	12 (6.0)
Chronic lung disease	14 (7.0)	14 (7.0)
Suicide	2 (1.0)	0
Pneumonia/influenza	17 (8.5)	15 (7.5)
Chronic liver disease	1 (0.5)	0
Diabetes mellitus	0	0
Other	16 (8.0)	29 (14.5)
Not known	29 (14.5)	30 (15.0)

(ii) World War One

The study of World War One veterans focused on two randomly-selected samples: 126 cases of neurasthenia/shell shock and 139 cases of DAH. Each group was matched with veterans who had been awarded a pension for a minor gunshot wound. The matching was by both percentage disability, region of the UK and rank. Cause of death, where known, was coded for comparison. The average ages at death for the four populations were calculated (Table 29).

Table 29 Mean Ages at Death by Diagnosis

Groups	Mean	Number	Standard Deviation
DAH	85.11	139	8.97
DAH controls	89.74	139	9.06
Neurasthenia	89.83	126	9.47
Neurasthenia controls	89.03	126	9.74

Taking the neurasthenia/shell shock sample, a Cox regression, a second Cox regression adjusted for matching and a Wilcoxon signed-rank test ($p = 0.793$) all suggested that there was no statistically significant difference in their rates of mortality (Table 30). A Pearson's correlation showed that there was no association between the assessed level of disability and age at death (0.044 with 95% confidence limits of -0.132 to 0.217).

Table 30 World War One Neurasthenia mortality study

	Hazard ratio	Standard error	z	p	95% confidence interval
DAH/VDH	0.967	0.123	-0.26	0.794	0.754 to 1.241
DAH/VDH adjusted	0.967	0.125	-0.26	0.797	0.751 to 1.246

As regards cause of death, a simple cross tabulation of the neurasthenia cases and their controls showed no obvious pattern of difference (Table 31).

Table 31 Cause of death for the Neurasthenia cohort

Cause of death	Neurasthenia (n = 126)	GSW (n = 126)
Heart disease	36 (28.6)	44 (34.9)
Cancer	9 (7.1)	14 (11.1)
Accident	3 (2.4)	2 (1.6)
Stroke	11 (8.7)	16 (12.7)
Chronic lung disease	6 (4.8)	3 (2.4)
Suicide	0	0
Pneumonia/influenza	21 (16.7)	19 (15.1)
Chronic liver disease	0	0
Diabetes mellitus	0	0
Other	6 (4.8)	11 (8.7)
Not known	34 (27.0)	17 (13.5)

The DAH/VDH sample has proved more complex. A Cox regression, a second Cox regression adjusted for matching and a Wilcoxon signed-rank test ($p = <0.001$) all suggested that there was a statistically significant difference in their rates of mortality (Table 32). However, a Pearson's correlation showed that there was no association between the assessed level of disability and age at death (0.090 with 95% confidence limits of -0.078 to 0.253).

Table 32 World War One DAH/VDH mortality study

	Hazard ratio	Standard error	z	p	95% confidence interval
DAH/VDH	1.693	0.214	4.17	<0.001	1.322 to 2.170
DAH/VDH adjusted	1.693	0.213	4.18	<0.001	1.323 to 2.167

It is difficult to explain what appear to be conflicting results. First, the samples are small and randomly selected from an unrepresentative group of World War One veterans. The reduced life-expectancy of the DAH/VDH pensioners does not appear to have been the result of undetected cardiac disease. Death from heart disease in the DAH/VDH group was not significantly greater than the controls (Table 33).

Table 33 Cause of death for the DAH/VDH cohort

Cause of death	DAH (n = 139)	GSW (n = 139)
Heart disease	49 (35.3)	46 (33.1)
Cancer	15 (10.8)	11 (7.9)
Accident	0	1 (0.7)
Stroke	8 (5.8)	10 (7.2)
Chronic lung disease	2 (1.4)	8 (5.8)
Suicide	0	0
Pneumonia/influenza	17 (12.2)	27 (19.4)
Chronic liver disease	0	0
Diabetes mellitus	0	0
Other	6 (4.3)	9 (6.5)
Not known	42 (30.2)	27 (19.4)

First, it was hypothesised that bias was introduced by the physicians appointed to assess the veteran's disability. By 1918, DAH was widely recognised as a functional disorder, while shell shock was considered an honourable outcome of battle and at one time entitled the sufferer to wear a wound stripe. During 1916, for example, Mott still believed that shell shock might have an organic cause. It has already been shown (Table 18) that in practice pensions for neurasthenia/shell shock tended to be more generous than those for DAH. It is possible that physicians were less sympathetic to servicemen with a diagnosis of DAH and granted them lower percentages. Accordingly, their disabilities may have been under assessed in comparison with other pensioners, and this, in turn, may explain why their life expectancy was shorter. As a result, the World War One, DAH sample was matched with veterans with gunshot wounds whose disability had been assessed 20% higher (the smallest increment allowed by the pensions system) to test whether systematic bias existed in the assessment programme. Although the two Cox regressions and a Wilcoxon signed-rank test ($p = 0.237$) showed a reduction in the differences between the two groups this remained statistically significant (Table 34). However, a Pearson's correlation showed that there was no association between the assessed level of disability and age at death (0.022 with 95% confidence limits of -0.190 to 0.147).

Table 34 DAH/VDH compared with adjusted controls

	Hazard ratio	Standard error	z	p	95% confidence interval
DAH/VDH	1.218	0.214	4.17	0.101	0.962 to 1.541
DAH/VDH adjusted	1.218	0.151	1.59	0.112	0.955 to 1.552

It was then hypothesised that advances in cardiology pioneered during World War One had enabled physicians to distinguish more accurately between functional cardiac disorders (DAH) and those with an organic basis (VDH). It was assumed that the inclusion of 60 cases of VDH may have introduced an element of genuine heart disease, which accounted for the difference in the mortality rates. This group was removed from the sample and the test re-run. Nevertheless, a Cox regression, a second Cox regression adjusted for matching and a Wilcoxon signed-rank test ($p = <0.001$)

all suggested that there was a statistically significant difference in their rates of mortality (Table 35). However, a Pearson's correlation showed that there was no association between the assessed level of disability and age at death (0.255 with 95% confidence limits of 0.034 to 0.452).

Table 35 World War One DAH mortality study

	Hazard ratio	Standard error	z	P	95% confidence interval
DAH alone	1.548	0.261	2.59	0.010	1.112 to 2.155
DAH adjusted	1.548	0.252	2.68	0.007	1.125 to 2.130

The significantly shortened life expectancy of the DAH cases from World War One is difficult to explain in the light of the other two sets of results. For the Boer War sample of DAH/VDH cases and the World War One sample of neurasthenia/shell shock no statistically significant difference was observed. Why, then, should there be this discrepancy? Because DAH, re-classified as effort syndrome, became a discredited disorder during World War Two, the Ministry of Pensions may have made a concerted attempt to discontinue pensions awarded to veterans who were assessed as being in sound health. Neurasthenia or shell shock was not subject to similar investigations and popular opinion remained sympathetic to such veterans. It is possible therefore that healthy DAH cases had their pensions curtailed more efficiently than veterans diagnosed with neurasthenia. There is some evidence in the official Ministry of Pensions reports to support this hypothesis. An analysis of all stabilised (those with a finalised percentage) pension awards in March 1929 showed that 3.2% of the 47,668 neurasthenia/shell shock awards were at the 70% to 100% level. By comparison, only 0.3% of the 38,367 DAH awards were at that high level (Mitchell and Smith, 1931, 349). The bias and the improved methods of diagnosis may have acted not when the pension was initially awarded but later when ex-servicemen were re-assessed and monitored. An analysis of the cause of death in the 79 DAH cases versus controls did not reveal any significant difference for heart disease, stroke, chronic lung disease, pneumonia/influenza, though cancer rates were significantly greater (Table 36).

Table 36 World War One DAH mortality study

Cause of death	Hazard ratio	Standard error	z	P	95% confidence interval
Heart disease	1.083	0.336	0.26	0.798	0.589 to 1.988
Cancer	4.552	2.641	2.61	0.009	1.460 to 14.194
Stroke	1.462	0.851	0.65	0.515	0.467 to 4.573
Lung disease	1.378	1.396	0.32	0.752	0.189 to 10.038
Pneumonia/influenza	1.369	0.541	0.79	0.427	0.631 to 2.972

Key Research Accomplishments

In the three years of this study, the key research accomplishments are as follows:

- The identification of important primary sources some of which are not open to public scrutiny and have never before been the subject of systematic study.
- The design and completion of the first historical database of war syndromes. Although a number of papers have addressed the issue of post-combat syndromes in the past, they were based on secondary sources and contemporary accounts. This is the first statistically-validated study of their symptomatology and incidence using primary sources.
- The project makes use of advanced statistical methods, including cluster analysis, to reinforce the quantitative evidence that has been presented.
- The study represents an important addition to knowledge about war syndromes: their essential characteristics, and those servicemen who suffered from them.
- This information has implications for treatment strategies and preventative measures.

Reportable Outcomes

1. Publications and manuscripts

We have already published a number of subsidiary or related studies; they include:

Jones, E. and Wessely, S. (1999) Case of chronic fatigue syndrome after Crimea war and Indian mutiny. *BMJ* 2: 1645-57.

Jones, E. and Palmer, I. (2000) Army Psychiatry in the Korean War: the experience of 1 Commonwealth Division. *Military Medicine* 165: 256-60.

Jones, E. and Wessely, S. (2001) The impact of total war on the practice of British psychiatry. In R. Chickering and D.S. Mattern, *The Shadows of Total War, Europe, East Asia and the United States 1919-1939*. Cambridge: Cambridge University Press (in press).

Jones, E. and Wessely, S. (2001) Psychiatric battle casualties: an intra- and inter-war comparison. *British Journal of Psychiatry* 178: 242-47.

Jones, E. and Wessely, S. (2001) The origins of British military psychiatry before the First World War, *War and Society* (in press).

Jones, E., Palmer, I. and Wessely, S. (2001) War Pensions 1900-1945: A barometer of health beliefs and psychological understanding, *British Journal of Psychiatry* (submitted).

Jones, E., Hyams, K.C. and Wessely, S. (2001) Screening for vulnerability to psychological disorders in the military: an historical survey, *Annals of Internal Medicine* (submitted).

2. Presentations

The study and various aspects of its design have been presented at a number of conferences by Dr Edgar Jones. These included:

- a) Tri-Service Psychiatric Conference, Royal Defence Medical College, Gosport, in October 1997: a presentation on the history of war syndromes to psychiatrists and psychiatric nurses from all three services.

- b) Conference organised by the Institute of Medicine to inform the principal investigators of 'Strategies to Protect the Health of Deployed US Forces' in July 1998: presentation on the history of war syndromes.
- c) Thirteenth Conference on Military Medicine at Washington in May 1999, which addressed 'Unexplained Symptoms after War and Terrorism, Building towards a Consensus': Edgar Jones chaired the Social Science Research panel and served on the Consensus Committee.
- d) International conference at the University of Southampton on 'Memories of Catastrophe' (after war, natural disasters and atrocity) in April 2000: a presentation on the psychological impact on military psychiatrists who had treated servicemen with war syndromes.
- e) Royal College of Psychiatrists Annual Meeting for July 2000: presentation on the history of war syndromes for the New Research Section on 'Armed Forces, Conflict and Mental Health'.
- f) The Royal College of Psychiatrists Annual Meeting for July 2001: presentation on 'The birth of military psychiatry: its pre-1914 history in the UK'.

Conclusions

Modern wars, often involving periods of intense fighting, produce disorders for which no clear organic cause can be found. War syndromes are expressed by similar clusters of medically unexplained symptoms. These tend to be non-specific and are both physical and psychological. Among bodily sensations, the following are important: breathlessness, fatigue, dizziness, headache, difficulty in sleeping, joint stiffness and chest pain. Psychological signs include persistent anxiety, depression and feeling distant or cut off from others.

Although similar symptoms recur after most major conflicts, individual wars generate their own physical focus, diagnostic terms and explanations. The American Civil War produced irritable heart or Da Costa's syndrome. In the UK, campaigns fought in the mid- and late-nineteenth century witnessed the use of terms such as palpitation and debility. The Boer War saw DAH and rheumatism as significant causes of medical discharge from the armed forces. World War One led to diagnoses of shell shock and the new term effort syndrome was coined by Thomas Lewis in 1917. During World War Two dyspepsia and suspected duodenal ulcer were often the cause of men being invalided from the services. The physical focus of war syndromes appears to be closely related to the dominant health concerns of the period.

This study suggests that war syndromes from the Boer War to the present can be divided into three overlapping categories:

Group one: a post-combat syndrome typified by chronic fatigue and prevalent during the late nineteenth century and World War One.

Group two: a somatic disorder with a focus on the heart typical of World War One though with less common representatives during the Boer War and World War Two.

Group three: a post-combat syndrome with psychological characteristics and associated somatic symptoms more typical of World War Two and the Gulf War.

There does not appear to be a single post-combat syndrome common to all wars but a variety of presentations, which have evolved as the nature of combat itself has changed, medical knowledge advanced and cultural shifts occurred.

Although veterans suffering from Gulf-related illnesses can be found represented in all three categories, 216 (54%) fell into the third group, and a further 146 (36.5%) in group one. Not all servicemen engaged in the same conflict will respond in exactly the same way, though there will be underlying trends in the pattern or post-combat syndromes.

War syndromes affect combat, combat support and non-combatant troops alike, and in roughly the proportions that they exist in the armed forces. Rank is not a protector, though in recent years NCOs appear to suffer disproportionately, while officers seem to experience fewer symptoms. As regards military conduct, servicemen with these disorders tend to have good disciplinary records; they are not malingerers or repeat offenders.

Attributions presented by servicemen have varied considerably over the last century. In part, they appear to be culturally determined, reflecting contemporary health beliefs and the state of medical and military knowledge. Explanations ranged from external physical factors (intemperate climate or chemical exposure) through to internal psychological conflict (stress in battle or worry of family circumstances).

In many cases war syndromes were preceded by a wound or recognised illness (commonly influenza, pneumonia or fever). Although the symptoms of the subsequent disorder were not always the same, the hospitalisation and earlier experience of being ill appears to have served as a framed subsequent bodily sensations and behaviour.

So what then are the implications of these findings? Why is it important to understand more about war syndromes, their nature and who suffers from them? First, they have arisen after most major wars over the last century, and they are therefore likely to continue to appear in varied forms. Secondly, they are pensionable disorders. In the past, when largely untreated, they cost governments considerable sums in financial compensation. If preventative measures are to be put in place and effective treatments devised, it is necessary to know which troops are at risk and what interventions are most likely to address these disorders. If each new war syndrome is not seen as a unique and novel illness, but as part of an understandable pattern of responses to war, then it may be managed in a more effective manner.

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Appendices

Contextual Archival Research

(i) At the Public Record Office: the archives of the Ministry of Pensions, the War Office and the Prime Minister's Office have been surveyed, and the following files investigated:

a). *From the former Ministry of Pensions* (Class PIN).

53-58 Minutes of the board for the treatment of neurasthenia (shell shock) from 1917-1933.

2208 Neurasthenia, definition of nervous shock and war injury(1939-44).

2399 Neurasthenia and psychoses: treatment and entitlement to pension (1939-42).

2400 Neurasthenia treatment and pension rights (1943-44).

- 2401 Report of the Committee on Neurasthenia (1939).
- 2402 Inter-departmental action on the report of the Neurasthenia Conference (1939-40).
- 2403 Standing Committee on neurosis in wartime: appointment of sub-committee, minutes of meetings, report to minister (1940-42).
- 2404 Joint Committee on Neurosis in Service Cases (1940-41).
- 2405 Neurosis attributable to war service: treatment of men discharged from services (1941-42).
- 4039 The effects of gas poisoning in the First World War on eyesight (keratitis) and its physiological impact (1937-38).
- 4040 Neuroses, psychoses etc. translations of papers from German (1953).

b). *From the War Office archives* (Class WO).

- 32/2791 Classification of War Wounds according to their severity (1917)
- 32/2792 Classification of War Wounds, incorporating the findings of the specially constituted committee (1920)
- 32/2793 Post-war disability pensions supplementary recommendations after discharge (1921-22).
- 32/4747 War Office Committee of Inquiry into Causation and Prevention of Shell Shock: minutes and correspondence relating to the setting up, membership, terms of reference and conduct of the Committee (1920-22).
- 32/4748 Report of the War Office Committee of Inquiry into Shell Shock (1922)
- 32/6183 Report by the Raglan Committee and memorandum by Lord Stanley on Disability Pensions (1901)
- 32/11222 Report of the Baldwin Committee on Disability Pensions (1919-22)
- 32/11400 Report of the Disability Pensions Committee (1920-21)
- 32/11972 Use of Psychologists and Psychiatrists in the Services – Enquiry by Lord Privy Seal (1942-46)
- 32/11973 An interim report from the Ministerial Committee on the Work of Psychologists and Psychiatrists in the Services (1943-44)
- 32/11974 Work of Psychologists and Psychiatrists in the Services: minutes of meetings and policy statements (1946-47)
- 32/13462 Army Psychiatry Advisory Committee, minute sheets, correspondence and details of meetings (1945-66)
- 33/199 Report of the Committee on Disability Pensions chaired by Lord Raglan (1901)
- 33/247 Report of the Committee on revised regulations for Wounds and Injury Pensions (1902)

- 108/129 South African War return of invalids (1902)
- 108/165 RAMC Reports on servicemen in South Africa (1901-02)
- 108/390 General Sir W.D. Wilson, *Report on the Medical Arrangements in the South African War*, London: HMSO (1904).

- 222/8 Notes on the administration of Army psychiatry (1939-43)
- 222/103 Return of all psychiatric patients seen in all commands (1942)
- 222/846 Reports of the work of the Medical Division of Military (P) Hospital, Northfield, Birmingham (July 1943-January 1944).
- 222/2151 Medical History of the Second World War: Army Medical Services statistical returns by command and disorder (1939-45)

c). *Prime Minister's Office* (PREM 4)

15/2 Correspondence and minutes from the enquiry set up to investigate the role of psychiatrists and psychologists in the Army (1942-44).

(ii) At the Department of Social Security's archive in Nelson, Lancashire:

Historical texts from the former Ministry of Pensions library have been studied. These include the 39 issues of *The War Pensions Gazette*, first published in May 1917 and discontinued in July 1920. This was a semi-official journal, published monthly by His Majesty's Stationary Office. It was aimed at staff of the Ministry, members of the local pension boards and pensioners themselves. Costing two old pence, the *Gazette* gave advice on rehabilitation, treatment and legal issues and provided details of parliamentary debates. Other texts and reports include *Comparative Tables* (1919), *Reports made to the Prime Minister by the British Legion* (1938), Devine and Brandt (1919), McMurtrie (1918), Peterson (1930), and Sherren (1921).

(iii) At the Wellcome Institute for the History of Medicine in the Contemporary Medical Archive Centre:

The papers of physicians and psychiatrists, including

Sir Thomas Lewis (1881-1945), cardiologist working with troops suffering from DAH (PP/LEW).

Sir William Sargent (1907-1988), psychiatrist at Sutton Emergency Hospital (PP/WWS).

Dr S.H. Foulkes (1898-1976), psychiatrist at Northfield Military Hospital (PP/SHF).

Charles Wilson, Lord Moran (1882-1977), regimental medical officer during the First World War and author of a study on the nature of courage (PP/CMW).

Dr S.H. MacKeith, RAMC psychiatrist and medical superintendent of Napsbury Mental Hospital, St Albans (GC/135).

The Royal Army Medical Corps Muniment Collection (RAMC).

(iv) The National Army Museum: official regimental histories and publications together with contemporary accounts by servicemen of their experiences at war have been researched to fill gaps and provide supplementary information for the database.

(v) The Imperial War Museum, Sound Archive: 28 interviews of servicemen and RAMC physicians and psychiatrists have been transcribed relating to the First World War, Second World War and Korea. These accounts are an invaluable record of personal experiences.

Appendix II

Coding for the cluster analysis

Columns	Data
1	Case number
(a) <i>Background military and biographical data</i>	
2	War (0 = other; 1 = Boer; 2 = WW1; 3 = WW2; 4 = Korea/Malaya; 5 = Gulf)
3	Gender (0 = male; 1 = female)

- 4 Diagnosis (1 = rheumatism; 2 = cardiac; 3 = debility; 4 = neurasthenia; 5 = DAH; 6 = psychoneurosis; 7 = effort syndrome; 8 = dyspepsia; 9 = Gulf-related illness; 10 = gassed)
- 5 Rank (1 = officer; 2 = NCO; 3 = other ranks; 4 = nurses)
- 6 Combat exposure (0 = not engaged in combat; 1 = exposed to combat; NA = Not known)
- 7 Type of recruit (1 = regular; 2 = militia; 3 = territorial; 4 = volunteer; 5 = conscript; 6 = reserve)
- 8 Type of unit (1 = non-combat; 2 = combat; 3 = combat support)
- 9 Gassed
- 10 Explosion
- 11 Buried
- 12 Wounded
- 13 Fire attack
- 14 Other
- 15 Attribution (1 = physical illness; 2 = physical injury/strain; 3 = climate/environment; 4 = toxic exposure; 5 = psychological/service; 5 = psychological/domestic; NA = not known)
- 16 Military conduct (1 = exemplary; 2 = very good; 3 = fair/poor; 4 = poor; NA = not known)
- 17 Illness before war syndrome (0 = no illness; 1 = illness; NA = not known)

(b) Symptoms

- 18 Difficulty with tasks
- 19 Fatigue
- 20 Forgetfulness
- 21 Rapid heartbeat
- 22 Shortness of breath
- 23 Stomach cramps
- 24 Diarrhoea
- 25 Headaches
- 26 Tremor
- 27 Dizziness
- 28 Pains in joints
- 29 Weakness
- 30 Back pain
- 31 Tenderness
- 32 Persistent cough
- 33 Heavy sweating
- 34 Depression
- 35 Irritability
- 36 Poor concentration
- 37 Anxiety
- 38 Jumpiness
- 39 Changes in personality
- 40 Difficulty sleeping
- 41 Nightmares
- 42 Changes in weight